PEDIATRIC ANESTHESIA II

Title: CUTANEOUS PO₂ MONITORING DURING PEDIATRIC CARDIAC SURGERY

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Introduction. Continuous non-invasive assessment of oxygenation to prevent hyperoxia and detect hypoxia is a desirable feature of cutaneous oxygen tension (CPO₂) monitoring. Although the viability of CPO₂ in babies with normal perfusion state and arterial oxygen tension has been demonstrated, its function during N₂O and Halothane anesthesia has not been fully assessed. This is a preliminary study using an electrode with different polarization voltage and electrolyte composition.

Methods. Nine infants (3 days - 4 years) undergoing palliative or corrective cardiac surgery for congenital heart disease were studied. Anesthesia was induced with Halothane and maintained with N₂O - O₂ and relaxants. CPO₂ was continuously monitored and recorded using Roche Cutaneous Oxygen Monitor 630, Module 632. The CPO₂ electrode was heated to 44°C and placed on left upper arm. The bias voltage of the membrane was changed to 600 mV to make it insensitive to N₂O. All patients had an indwelling radial artery catheter for clinical indications. After calibration in room air, when steady state CPO₂ was achieved, CPO₂ was continuously recorded and compared with simultaneously measured arterial oxygen tension (PaO₂) at different intervals.

Results. Correlation of PaO₂ with CPO₂ was sought during hypoxic-normoxic state (PaO₂ 27-92 mm Hg) and hyperoxic state (PaO₂ 105-439 mm Hg). Forty nine estimations were performed. During hypoxic-normoxic state, the correlation coefficient for PaO₂ in neonates was 0.99 (Figure). When values for neonates and infants were combined, the correlation decreased to 0.94. During hyperoxic state, no good correlation existed between PaO₂ and CPO₂ (r=0.11).

Discussion. Anesthesiologists are concerned about unsuspected and undocumented periods of hypoxia and/or hyperoxia during surgery in infants. Technical and clinical problems of arterial stick and cannulation make CPO₂ monitoring an appealing procedure. Our study indicate that presence of N₂O and Halothane has minimal effects on Roche CPO₂ sensor. Although CPO₂ will detect hypoxia, it does not provide any safety feature for avoidance of risk associated with high oxygen concentration. Therefore, CPO₂ cannot be advocated as a substitute for PaO₂ analysis during surgery, but when combined with continuous monitoring of inspired oxygen tension and maintenance of normoxia, it will reduce the frequency of arterial PO₂ analysis and improve patient anesthetic care.

References.

Figure: Correlation between Cutaneous PO₂ (CPO₂) and arterial PO₂ (PaO₂) values in neonates and infants under Halothane - N₂O anesthesia during hypoxic - normoxic state.